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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/965,630	09/27/2001	Jason K. Shiepe	PES-0043	2487
23462	7590	12/13/2005	EXAMINER	
CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			CREPEAU, JONATHAN	
			ART UNIT	PAPER NUMBER

1746

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/965,630

Applicant(s)

SHIEPE ET AL.

Examiner

Jonathan S. Crepeau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2,5-10,15-25,51 and 57-67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2,5-8,15-17,20-25,51 and 57-67 is/are rejected.
- 7) ☒ Claim(s) 9,10,18 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 2, 5-10, 15-25, 51, 57, and newly added claims 58-67. A new ground of rejection has been applied to claims 8 and 57-62, but this rejection was not necessitated by amendment. Claims 2, 5-7, 15-17, 20-25, 51, and 63-67 remain rejected for substantially the reasons of record. Applicant's arguments with regard to claims 9, 18, and 19 are persuasive and these claims are now considered to contain allowable subject matter. This action is non-final.

Claim Suggestions

2. In claim 25, last clause, it is suggested that - "wherein the polymeric material comprises" be amended to include --further-- before "comprises." In claims 22 and 25, it is suggested that the claims be amended to clearly specify which of the porous support(s) have a graded hydrophilicity or if it is the flow field member as a whole that has a graded hydrophilicity. Currently the claims recite "a porous support" having a graded hydrophilicity but then define second and third porous supports with no further details regarding the hydrophilicity.

Claim Objections

3. Claim 10 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 10 recites that the porous support is a carbon cloth, but parent claim 21 defines the porous support as comprising a metal. Correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 8 and 57-62 are rejected under 35 U.S.C. 102(e) as being anticipated by Fuglevand et al. The reference teaches a fuel cell comprising first and second electrodes (160), an electrolyte membrane (151), first and second flow fields, and porous flow field members (171, 172) in fluid communication with the flow fields (see Fig. 26). The member comprises a porous support having a series of layers (in layer 171) having a hydrophilicity gradient (see col.11, line 8). Layer 171 comprises particulate carbon and a hydrophobic polymer (e.g., PTFE) and/or a hydrophilic polymer (e.g., ionomer) and layer 172 comprises a carbon cloth integrated

with polymer (see col. 9, line 42, col. 9, line 52, col. 10, line 66). Layer 171 comprises 20-90% of support material (i.e., particulate carbon). Although Fuglevand does not teach an electrically conductive material comprising one of the claimed species, such material is optionally recited in claim 8. Dependent claims 57-62 are also anticipated because the claims further limit the optional component.

Claim Rejections - 35 USC § 103

6. Claims 2, 5-7, 20, 21 and 63-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand (U.S. Patent 6,030,718) in view of Wilson (U.S. Patent 5,641,586) and Speranza et al.

Fuglevand et al. is applied to claims 8 and 57-62 for the reasons stated above. However, the reference does not expressly teach that the porous supports comprise metal screens or sintered metal cloths, as recited in claim 21, or that such supports are made of Nb, Zr, Ta, Ti, steel, Ni, Co, and mixtures and alloys thereof.

Wilson et al. teach a fuel cell comprising first and second electrodes, an electrolyte membrane, first and second flow fields (12), and a porous flow field member (24) in fluid communication with the first flow field (see Fig. 1B). The member comprises a porous support modified to provide hydrophilicity or hydrophobicity (see col. 4, line 46 et seq). The porous support may comprise sintered particles, woven metal screens (cloths), and non-woven metal screens (see col. 5, line 10).

Therefore, the artisan would be motivated to use the structures of Wilson '586 in the fuel cell of Fuglevand because the disclosure of Wilson '586 indicates that metal screens and cloths are functionally equivalent to carbon cloths when used in porous current-collecting members for fuel cells. As such, it would be obvious to substitute the metal screens or cloths of Wilson '586 for the carbon paper of Fuglevand. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

Wilson does not expressly teach that the support is a sintered metal cloth. However, the artisan would be motivated to sinter the metal cloth of Wilson '586. Such a sintering step would serve to increase the structural integrity of the cloth because the fibers would be fused together. Further, as noted above, Wilson '586 teaches "sintered particles," therefore fairly suggesting such a sintering step.

Wilson further does not expressly teach that the flow field members comprise an electrically conductive material selected from the group consisting of Nb, Zr, Ta, Ti, steel, Ni, Co, and mixtures and alloys thereof.

Speranza et al. is directed to a screen/frame assembly for an electrochemical cell. The screen functions as a gas diffusion member and is made of Nb, Ni, Co, Zr, Ti, steel, or Ti.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the materials of Speranza et al. in the flow field members of Wilson. The disclosure of Speranza et al. indicates that Nb, Ni, Co, Zr, Ti, steel, or Ti. are suitable materials for use as flow field

members. The selection of a known material based on its suitability for its intended use has generally been held to be *prima facie* obvious (MPEP §2144.07). As such, it would be obvious to use the materials of Speranza in the flow field member of Wilson (and thus Fuglevand).

7. Claims 15, 22-25 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of WO 97/213287.

Fuglevand teaches a fuel cell comprising first and second electrodes (160), an electrolyte membrane (151), first and second flow fields, and porous flow field members (171, 172) in fluid communication with the flow fields (see Fig. 26). The member comprises a porous support having a series of layers (in layer 171) having a hydrophilicity gradient (see col.11, line 8). Layer 171 comprises particulate carbon and a hydrophobic polymer (e.g., PTFE) and/or a hydrophilic polymer (e.g., ionomer) and layer 172 comprises a carbon cloth integrated with polymer (see col. 9, line 42, col. 9, line 52, col. 10, line 66). Layer 171 comprises 20-90% of support material (i.e., particulate carbon). The reference further teaches that the layer 171 comprises a plurality of layers but does not expressly teach that the layers each have a different porosity, as recited in claims 15, 22 and 51.

WO '287 teaches a fuel cell comprising first and second electrodes, an electrolyte membrane, first and second flow fields (17), and porous flow field members (16) in fluid communication with the flow fields (see Figs. 2 and 8). The member comprises a porous support

modified to provide hydrophilicity or hydrophobicity. The support can be made of electrically conductive carbon cloth and a polymer (i.e., PTFE or ion exchange resin) (page 12, line 1 et seq.). The member comprises two layers (18, 16), each having a different porosity (see col. 10, line 32 et seq.). Further, the reference teaches that the supports may comprise a titanium-based compound (see page 12, line 10).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of WO '287 vary the porosity across the plurality of layers of Fuglevand in addition to the hydrophobicity. At page 4, line 11, WO '287 teaches the following:

It has been discovered that the fuel cells of the fourth and fifth aspects of the invention as well as fuel cells prepared by the process of the sixth aspect of the invention are able to operate at a high current density at a relatively high voltage, have a relatively high power density, and provide a high power density even when operated under relatively low gas pressures.

As such, the artisan would be motivated by this disclosure to vary the porosity across the plurality of layers of Fuglevand. Further, it is noted that the reference teaches "at least two" portions with different mean pore sizes (e.g., page 3, line 26). This disclosure fairly suggests that the porous member may have more than two layers. As such, it would have been obvious to use a third support in the member in the fuel cell of Fuglevand, such support having a larger porosity than the second support (note teachings of increasing porosity on page 14, line 18 et seq. of WO '287). It is further noted that the duplication of parts is generally not considered to distinguish over a reference (MPEP §2144.04).

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8. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of WO '287 as applied to claims 15, 22-25 and 51 above, and further in view of Wilson '586.

Fuglevand does not expressly teach that the porous supports comprise metal screens or sintered metal cloths, as recited in claims 16 and 17.

As noted above, Wilson '586 teaches or fairly suggests metal screens and sintered metal cloths as supports in porous members for fuel cells.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the structures of Wilson '586 in the fuel cell of Fuglevand. The disclosure of Wilson '586 indicates that metal screens and sintered metal cloths are functionally equivalent to carbon cloths when used in porous current-collecting members for fuel cells. As such, it would be obvious to substitute the metal screens or sintered metal cloths of Wilson '586 for the carbon paper of Fuglevand. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

Response to Arguments

9. Applicant's arguments filed September 26, 2005 have been fully considered but they are not persuasive. Applicants urge that a *prima facie* case has not been made with regard to claim

20. However, the metals of Speranza et al. would inherently be non-oxidizable at anodic potentials of less than about 4 volts, thereby meeting the subject matter of claim 20.

Regarding the rejection over Fuglevand in view of Wilson and Speranza, Applicants state that Wilson does not teach that metal screens are functionally equivalent to carbon cloths. Applicant's contention that the different porous structures have different properties is well taken; however, in the context of using such porous structures as flow-field members in fuel cells, the disclosure of Wilson still indicates that these materials are interchangeable. Absent a showing of new or unexpected results for using the claimed porous support structures as opposed to a carbon cloth, the rejection over Fuglevand in view of Wilson and Speranza is believed to be proper.

Regarding the rejection over Fuglevand in view of Mussell et al., Applicant states that "there is no motivation to change these specific teachings of these references." However, it is submitted that upon subjecting the layers of Fuglevand to a porosity gradient as suggested by Mussell et al., the fundamental character of the layers of Fuglevand would not be altered. The layers would still possess a hydrophilicity gradient, and the use of a porosity gradient in the layers would be a further improvement. Neither the composition of the layers nor the principle of operation of the Fuglevand apparatus would necessarily be altered by subjecting the layers to a porosity gradient. As such, the rejection is still believed to be proper.

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Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299.

The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr, can be reached at (571) 272-1414. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau
Primary Examiner
Art Unit 1746
December 8, 2005